

CLAIMS

1. A riser termination device comprising:
 - (a) a separation unit for receiving a gas-solids mixture from a riser and for separating solids from gas, said separation unit comprising:
 - (i) a substantially cylindrical internal downcomer pipe having an inlet, a downcomer portion having a vertical window located in a portion of said downcomer, and a downcomer floor provided with a solids distribution plate; and
 - (ii) a vapor outlet duct suitable for receiving gases from said vertical window and located concentrically outside said internal downcomer pipe and extending upwardly; and
 - (b) a crossover duct for connecting a riser reactor to the inlet of said internal downcomer pipe.
2. A riser termination device as defined in Claim 1 wherein said vapor outlet duct is provided with a second catalyst separation stage comprised of a catalyst shave-off window and an internal catalyst dipleg.
3. A riser termination device as defined in Claim 2 wherein said second catalyst stage is bounded by a helical baffle projection to guide the catalyst into said catalyst shave-off window.
4. A riser termination device as defined in Claim 3 wherein said helical baffle projection is support by at least one supporting rod.
5. A riser termination device as defined in Claim 1 wherein said crossover duct is positioned substantially 90° relative to the riser reactor.

6. A riser termination device as defined in Claim 5 wherein said downcomer pipe is further comprised of a sealing lid and an impact plate located above said downcomer and across from said crossover duct.
7. A riser termination device as defined in Claim 6 wherein said impact plate is concave in shape.
8. A riser terminator device as defined in Claim 1 wherein said vertical window has a length to diameter ratio of from about 4 to about 8.
9. A riser terminator device as defined in Claim 1 wherein said downcomer has at least two vertical windows.
10. A riser termination device as defined in Claim 1 wherein said vapor outlet duct is provided with a second catalyst separation stage comprised of a catalyst shave-off window at the top of said riser termination device, said catalyst shave-off window providing a light dusting of low velocity catalyst for coking control within a reaction containment vessel.
11. A riser termination device as defined in Claim 2 wherein said catalyst shave-off window is located at the top of said riser termination device and provides a light dusting of low velocity catalyst for coke control within a reaction containment vessel.
12. A riser terminator device as defined in Claim 1 wherein said riser is a downflow riser.
13. A riser termination device as defined in Claim 10 wherein said vapor outlet duct is effectively formed by the geometry of the containment vessel head.

14. A riser termination device as defined in Claim 11 wherein said vapor outlet duct is effectively formed by the geometry of the containment vessel head.
15. A riser terminator device as defined in Claim 1 that is contained in a riser containment vessel.
16. A riser terminator device as defined in Claim 2 that is contained in a riser containment vessel.
17. A riser terminator device as defined in Claim 15 wherein said solids distribution plate is operatively connected to a bath tub sealing means for re-aerating the solids, said bath tub sealing means comprising:
 - (a) a containment means for receiving and containing said solids;
 - (b) an aeration means for fluidizing solids contained in said containment means; and
 - (c) a solids outlet means for allowing fluidized solids to exit the containment means.
18. A riser termination device as defined in Claim 17 wherein said bath tub device aeration means comprises steam nozzles for injecting steam into said containment means.
19. A riser termination device as defined in Claim 18 wherein said bath tub device fluidized solids outlet comprises at least one solids overflow point and one catalyst drain.

20. A riser termination device as defined in Claim 19 wherein a portion of said bath tub device containment means seals the bottom said riser terminator device.
21. A riser termination device as defined in Claim 20 wherein the portion of said bath tub device containing said solid distributor notches is open to said disengager vessel.
22. A riser termination device as defined in Claim 21 further comprising a vapor receiving hood located above the top of said vapor outlet duct.
23. A riser termination device as defined in Claim 22 wherein said vapor receiving hood is positioned adjacent to the top of said vapor outlet duct.
24. A riser termination device as defined in Claim 22 wherein said vapor receiving hood is concentric with the top of said vapor outlet duct and overlaps with the top of said vapor outlet duct forming an annular gap for thermal expansion and to facilitate catalyst separation into the containment vessel.
25. A riser termination device as defined in Claim 23 wherein said vapor receiving hood is further operatively connected to at least one secondary cyclone.
26. A riser termination device as defined in Claim 24 wherein said vapor receiving hood is further operatively connected to at least one secondary cyclone.
27. A bath tub solids container for containing solids separated from cracked product vapors from a separator, said bath tub solids container comprising:

a containment means for receiving and containing solids from said separator; an aeration means for fluidizing solids contained in said containment means; and a fluidized solids outlet means for allowing fluidized solids to exit the containment means.

28. A bath tub solids container as defined in Claim 27 wherein said bath tub device aeration means comprises steam nozzles for injecting steam into said containment means.
29. A bath tub solids container as defined in Claim 28 wherein said bath tub device fluidized solids outlet comprises at least one catalyst distributor overflow point and one catalyst drain point.
30. A process for separating solids from cracked products comprising:
 - (a) withdrawing a mixed solids and cracked product stream from a riser reactor through a crossover duct located substantially 90° to said riser reactor;
 - (b) directing said mixed solids and cracked product stream against an impact plate to initially separate said cracked products from said solids and to change the direction of the cracked products and solids 90° downwardly in a capped downcomer pipe;
 - (c) collecting said initially separated solids on a floor of said downcomer pipe to further degas said solids and separate additional cracked product;
 - (d) allowing said solids from said floor bed to slide out of the bottom of said downcomer pipe;

- (e) withdrawing cracked products from said initial separation and from said degassing, along with a minor amount of entrained solids, out a window located in a lower portion of said downcomer pipe into a concentrically located vapor outlet duct; and
- (f) separating the majority of catalyst from horizontal flow out of said window by slowing down the gas directed against an inner wall of the separator and turning the gas flow upwards in the vapor outlet duct while the catalyst slows down and is withdrawn through a catalyst shave-off window in the bottom of the vapor outlet duct;
- (g) providing a catalyst concentration point and a third stage of catalyst separation at the top of the vapor outlet duct, said separation providing for ensuring very low catalyst content in the cracked products and allowing for the utilization of smaller, more efficient final catalyst removal systems;
- (h) withdrawing said cracked products and entrained solids out the top of said vapor outlet duct and into a secondary cyclone for further separation of said entrained solids from said cracked products; and
- (i) recovering said cracked products.